
MATHEMATICAL AND COMPUTER MODELLING

(Formerly Mathematical Modelling)

EDITOR-IN-CHIEF: Ervin Y. Rodin

List of Contents and Author Index

Volume 15, 1991

NOW ACCEPTING
TEX MANUSCRIPTS



PERGAMON PRESS

Oxford • New York • Seoul • Tokyo

MATHEMATICAL AND COMPUTER MODELLING

(Formerly Mathematical Modelling)

Editor-in-Chief

Ervin Y. Rodin

Department of Systems Science and Mathematics
Campus Box 1040, Washington University
1 Brookings Drive

St Louis, MO 63130, U.S.A.

Tel.: 314-935-6007 or 935-5806

Fax: 314-935-4434

rodin@rodin.wustl.edu

uunet!wuarchive!rodin.wustl.edu!rodin

rodin%rodin.wustl.edu@wugate.wustl.edu

Founding Co-Editor-in-Chief: Xavier J. R. Avula

Book and Survey Editor: D.N.P. Murthy, Department of Mechanical Engineering, University of Queensland, St Lucia, Brisbane, Qld 4067, Australia. e4murthy%uqvax.decnet.uq.oz.au@uunet.uu.net

Editorial Assistant: Florence A. Schick, Department of Systems Science and Mathematics, Campus Box 1040, Washington University, 1 Brookings Drive, St Louis, MO 63130, U.S.A.

Publishing Office

Pergamon Press plc, Pergamon House, Bampfylde Street, Exeter EX1 2AH, England [Tel. (0392) 51558; Fax 425370].

Subscription and Advertising Offices

Enquiries from customers in North America should be sent to Pergamon Press Inc., 395 Saw Mill River Road, Elmsford, NY 10523, U.S.A.; and from the rest of the world to Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, England [Tel. (0865) 794141].

Publication Frequency (1992): 13 issues/annum (Vol. 16 in monthly issues and Vol. 17 in one complete volume)

Annual Subscription Rates

Annual institutional subscription rate (1992), £735.00 (US\$1175.00); *2-year institutional rate (1992/93)*, £1396.50 (US\$2232.50). Sterling prices are definitive. U.S. dollar prices are quoted for convenience only, and are subject to exchange rate fluctuation. Prices include postage and insurance and are subject to change without notice. Subscription rates for Japan are available on request. Members of the AMS/MAA, SIAM, IAMCM and SES may order personal subscriptions at a concessional rate; details of these rates are available upon request.

Back issues

Back issues of all previously published volumes, in both hard copy and on microform, are available direct from Pergamon Press offices.

Copyright © 1991 Pergamon Press plc

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article

is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Whilst every effort is made by the publishers and editorial board to see that no inaccurate or misleading data, opinion or statement appears in this journal, they wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the sole responsibility of the contributor or advertiser concerned. Accordingly, the publishers, the editorial board and editors and their respective employees, officers and agents accept no responsibility or liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statement.

In order to make this issue/volume available as economically and as rapidly as possible, the authors' typescripts have been reproduced in either their original or reprocessed TEX format. The authors/Tecnological Associates are fully responsible for the quality and content of the text.

Photocopying information for users in the U.S.A.

The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the U.S. Copyright Law is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970, U.S.A.

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-fee Code for this publication is
0895-7177/91 \$3.00 + 0.00

List of Contents

NUMBER 1

- | | | |
|--|----|--|
| E. Gabetta | 1 | From stochastic mechanics to the discrete Boltzmann equation: The Broadwell model |
| P. R. Parthasarathy and B. Krishna Kumar | 11 | Density-dependent birth and death process with state-dependent immigration |
| K. M. Wgialla, A. M. Helal, and S. S. E. H. Elhashaie | 17 | The use of mathematical and computer models to explore the applicability of fluidized bed technology for highly exothermic catalytic reactions. I. Oxidative dehydrogenation of butene |
| A. I. Mees | 33 | Railway scheduling by network optimization |
| H. Gzyl | 43 | The max-ent approach to linear programming with quadratic errors |
| M. de la Sen | 47 | Algebraic results for linear-equation structures involving polynomial block-matrix partitions. Some implications in decentralized control theory |
| L. Ingber, H. Fujio and M. F. Wehner | 65 | Mathematical comparison of combat computer models to exercise data |
| | 91 | Mathematical and Computer Modelling Reports |

NUMBER 2

- | | | |
|--|----|---|
| A. Hariti | 1 | Stability diagram for a three parabolic equation system coming from biochemistry |
| V. K. C. Sanghi | 13 | Comments on the close similarity between Indian population projections from the constrained coalition and logistic model and the census, UN and Government of India estimates |
| W. Y. Tan | 19 | Some general stochastic models for the spread of AIDS and some simulation results |
| P. R. Parthasarathy and B. Krishna Kumar | 41 | The number and sum of lifetimes of overaged cells in modified branching processes |
| C. J. Goh and A. I. Mees | 49 | Optimal control on a graph with application to train scheduling problems |
| B. Cahlon, I. Gertsbakh, I. E. Schochetman and M. Shillor | 59 | A model for the convective cooling of electronic components with application to optimal placement |
| S. A. Book and M. R. Chernick | 77 | System error analysis based on one-at-a-time perturbations |
| | 85 | Mathematical and Computer Modelling Reports |

NUMBER 3-5

BOUNDARY INTEGRAL EQUATION METHODS (BOUNDARY ELEMENT METHODS)

G. S. Gipson and G. T. Symm	vii Preface
R. Aithal, S. Saigal and S. Mukherjee	1 Three-dimensional boundary element implicit differentiation formulation for design sensitivity analysis
S. Aoki and K. Kishimoto	11 Prediction of galvanic corrosion rates by the boundary element method
E. Alarcon, M. Cerrolaza, A. Madrid and F. Beltran	23 The p-adaptive BIEM version in elastostatics
A. Bossavit	33 The computation of eddy-currents, in dimension 3 by using mixed finite elements and boundary elements in association
C. A. Brebbia	43 Two different approaches for transforming domain integrals to the boundary
C. V. Camp and G. S. Gipson	59 Overhauser elements in boundary element analysis
A. Carini, M. Diligenti and G. Maier	71 Variational formulation of the boundary element method in transient heat conduction
A. Chandra and R. Srivastava	81 A boundary element analysis of axisymmetric upsetting
M. Costabel, V. J. Ervin and M. Stephan	93 Experimental convergence rates for various couplings of boundary and finite elements
T. A. Cruse and J. R. Osias	103 Issues in merging the finite element and boundary integral equation methods
J. Dominguez and R. Gallego	119 Time domain boundary element method for elastodynamic problems
S. J. Dunnett and D. B. Ingram	131 Use of the boundary element method to determine the sampling efficiency of blunt aerosol samplers
J. A. Garrido, A. Foces and F. Paris	143 BEM applied to receding contact problems with friction
I. R. Gonsalves, D. J. Shippy and F. J. Rizzo	155 The direct boundary integral equation method for the three- dimensional elastodynamic transmission problem
L. J. Gray	165 Evaluation of hypersingular integrals in the boundary element method
M. Guiggiani	175 The evaluation of Cauchy Principal Value integrals in the boundary element method—A review
E. B. Hansen	185 Stokes flow of a fluid layer over an obstacle on a tilted plane

D. B. Ingham, J. A. Ritchie and C. M. Taylor	195	The linear boundary element solution of Laplace's equation with Dirichlet boundary conditions
M. A. Jaswon and K. E. K. El-Damanawi	205	What is a dislocation?
D. L. Karabalis and C.-F. D. Huang	215	Inertial soil-foundation interaction by a direct time domain BEM
R. Kress	229	Boundary integral equations in time-harmonic acoustic scattering
S. Mukherjee and A. Chandra	245	A boundary element formulation for design sensitivities in problems involving both geometric and material nonlinearities
P. D. Panagiotopoulos	257	The boundary integral equation method for inequality problems
T. J. Rudolphi	269	The use of simple solutions in the regularization of hypersingular boundary integral equations
R. P. Shaw	279	Boundary element methods as weighted mean values
R. N. L. Smith and M. H. Aliabadi	285	Boundary integral equation methods for the solution of crack problems
M. Tanaka, M. Nakamura and K. Yamagiwa	295	Application of boundary element method for elastodynamics to defect shape identification
J. C. F. Telles and J. A. M. Carrer	303	Implicit procedures for the solution of elastoplastic problems by the boundary element method
W. S. Hall and T. T. Hibbs	313	Subtraction, expansion and regularising transformation methods for singular kernel integrations in elastostatics
W. L. Wendland and J. Zhu	325	Abstract—The boundary element method for three-dimensional Stokes flows exterior to an open space

NUMBER 6

H. Pham	1	Cost optimization of a class of noncoherent systems
J. C. Misra and B. K. Kar	9	A mathematical analysis of blood flow from a feeding artery into a branch capillary
W. L. Wendland and J. Zhu	19	The boundary element method for three-dimensional Stokes flows exterior to an open surface
C. Jian, Z. Weimin and W. Yongxian	43	The identification of an inheritance model and its application
I. Greenberg	51	"Explosive" processes in recidivism and other reinforcement models of learning
A. Nagurney and D.-S. Kim	55	Parallel computation of large-scale dynamic market network equilibria via time period decomposition
P. M. Rao and K. Kuwahara	69	Diffusion in shear flow between differentially moving parallel plates

- | | | |
|--|----|---|
| H. Pham | 77 | Optimal system size for k-out-of-n systems with competing failure modes |
| A. E. Ali and
A. M. A. Elsinari | 83 | Numerical mapping from space shuttle imaging radars SIR-A and SIR-B imagery |
|
<i>Educational Mathematical
and Computer Modules</i> | | |
| M. Olinick | 91 | Modelling depletion of nonrenewable resources |

NUMBER 7

- | | | |
|---|----|---|
| W. J. Turner,
P. S-J. Kwon and
P. A. Maguire | 1 | Evaluation of a gas pipeline simulation program |
| W. Y. Tan and C. Chen | 15 | Modelling the translocation induction in sperms—some general theories |
| P. Žitňan | 37 | The parametric least squares technique for double eigenvalue problems |
| S. S. E. H. Elnashaie,
K. M. Wagialla,
and A. M. Helal | 43 | The use of mathematical and computer models to explore the applicability of fluidized bed technology for highly exothermic catalytic reactions: II-Oxidative dehydrogenation of ethylbenzene to styrene |
| H. Gzyl | 55 | Probabilistic approach to wave propagation problems III: Brownian local times and waves in layered media |
| W. K. Chow and
N. K. Fong | 63 | A study of the effect of a line of sprinklers on the fire induced air flow using the two-dimensional field modelling technique |
| R. C. Vellore and
D. L. Olson | 83 | An AHP application to computer system selection |

NUMBER 8

- | | | |
|---|----|--|
| B. Wigdorowitz and
M. H. Petrick | 1 | Modelling concepts arising from an investigation into a chaotic system |
| J. B. Picone, N. Sperelakis
and J. E. Mann, Jr. | 17 | Expanded model of the electric field hypothesis for propagation in cardiac muscle |
| Z. Zlatev, J. Christensen,
J. Moth and J. Wasniewski | 37 | Vectorizing codes for studying long-range transport of air pollutants |
| B. A. Kramer and
C.-L. Hwang | 49 | Resource constrained project scheduling: Modelling with multiple alternatives |
| W. Han | 65 | A regularization procedure for a simplified friction problem |
| M. A. Venkataramanan
and M. Bornstein | 71 | A decision support system for parking space assignment |
| G. Marcos, S. TAILLEUR and
M. J. Bagajewicz | 77 | Analytical approximate solutions of certain nonlinear equations of reaction-diffusion kind |
| A. N. Zaretzky and
C. A. Leguizamón | 89 | Topologies for matter-energetical lattice representations of systems |

NUMBER 9

I. Kramer	1	Is AIDS an invariably fatal disease?: A model analysis of AIDS survival curves
C.-H. Hsu and K.-T. Lam	21	Automatic development of contracted graphs for kinematic chains with simple joints
J. Schlosser and B. Wendroff	39	Iterated games and arms race models
W. Han	47	Quantitative error estimates for material idealization of torsion problems
W. E. Stein and P. J. Mizzi	55	Estimation of the degree of market inefficiency in place and show betting at the racetrack
S. M. Kokoska, L. D. Meeker and H. J. Thompson	65	Analysis of chemoprevention experiments: The indefinite censoring model
J. J. Revetta, Jr.	77	Analytic hierarchy approach to CRAF contract proposals
J. A. Sjogren	87	Cycles and spanning trees

NUMBER 10

W. Woodside	1	The optimal strategy for running a race (a mathematical model for world records from 50 m to 275 km)
Y. Cherruault, A. Guillez, J. J. Fery and F. Marcassa	13	A new approach for thermic exchanges in oilwells drilling
A. S. A. Mohamed	19	Application of rough set theory for clinical data analysis: A case study
J. A. Bautista	39	Validation of the kinematic simulation of surge border irrigation
P. C. K. Kwong and B. Z. Guo	49	A time-dependent McKendrick population model for logistic transition
S. K. Saha and J. Angeles	61	The mathematics of motion for computer animation: A case study
C. S. Lee and G. Leitmann	79	A drug administration problem
B. R. Feiring	91	Production planning in stochastic demand environments
H. Greiner	97	A survey on univariate data interpolation and approximation by splines of given shape
H. Pascal and J. P. Pascal	107	Nonlinear effects of non-Newtonian fluids in unsteady flow with circular streamlines
P. R. Johnston	115	Diffusion in composite media: Solution with simple eigenvalues and eigenfunctions

D. Lavigne and Y. Cherruault	125	Alienor-Gabriel global optimization of a function of several variables
H. A. Donegan and F. J. Dodd	135	A note on Saaty's Random Indexes

NUMBER 11

E. Y. Rodin	1	Speed of publication—An editorial
X.-Q. Zhao	3	The qualitative analysis of n -species Lotka-Volterra periodic competition systems
W.-M. Hwang and Y.-W. Hwang	9	An algorithm for the detection of degenerate kinematic chains
M. S. El Naschie and S. S. E. H. Elnashaie	17	The connection between fluid and elastostatical turbulence
B. F. Gray, J. H. Merkin and G. C. Wake	25	Disjoint bifurcation diagrams in combustion systems
M. H. Holmes and J. Bell	35	Auditory transduction: A model for the role of intracellular calcium in short-term adaptation
S. Ghahramani	57	Balance equations for general tandem queues
M. Muraskin	63	Study of a three component lattice system
L. Ingber, M. F. Wehner, G. M. Jabbour and T. M. Barnhill	77	Application of statistical mechanics methodology to term-structure bond-pricing models
L. Ingber and D. D. Sworder	99	Statistical mechanics of combat with human factors
C. Betz and H. Gzyl	129	Probabilistic approach to wave propagation problems IV: Reflecting boundaries
J. M. Lambert	141	The extended Analytic Hierarchy Decision Method

NUMBER 12

E. Y. Rodin	1	Speed of publication—An editorial
C. Batur and V. Kasparian	3	Model based fuzzy control
H. M. Sauro and D. A. Fell	15	SCAMP: A metabolic simulator and control analysis program
J. B. Hughes	29	Second order sufficient conditions for optimizing with equality constraints

W. Y. Tan	37	Stochastic models of HIV epidemic in homosexual populations—The effects of mixing patterns
W. Han	67	Asymptotic error expansions for numerical solutions of one-dimensional problems with singularities
M. S. El Naschie	77	Mathematical model for chaos and ergodic criticality in four dimensions
L. S. Zaremba	81	Step-guided strategies for control problems with uncertain dynamics
R. R. Joshi	91	A probabilistic approach to antigen-antibody recognition
G. Jumarie	103	Extension of quantum information by using entropy of deterministic functions
J. C. J. Nihoul	117	Dissection of a mathematical model

Author Index

- Aithal, R.** 15(3-5),1
Alarcon, E. 15(3-5),23
Ali, A.E. 15(6),83
Aliabadi, M.H. 15(3-5),285
Angeles, J. 15(10),61
Aoki, S. 15(3-5),11

Bagajewicz, M.J. 15(8),77
Barnhill, T.M. 15(11),77
Batur, C. 15(12),3
Bautista, J.A. 15(10),39
Bell, J. 15(11),35
Beltran, F. 15(3-5),23
Betz, C. 15(11),129
Book, S.A. 15(2),77
Bornstein, M. 15(8),71
Bossavit, A. 15(3-5),33
Brebbia, C.A. 15(3-5),43

Cahlon, B. 15(2),59
Camp, C.V. 15(3-5),59
Carini, A. 15(3-5),71
Carrer, J.A.M. 15(3-5),303
Cerrolaza, M. 15(3-5),23
Chandra, A. 15(3-5),81,245
Chen, C. 15(7),15
Chernick, M.R. 15(2),77
Cherruault, Y.
 15(10),13,125
Chow, W.K. 15(7),63
Christensen, J. 15(8),37
Costabel, M. 15(3-5),93
Cruse, T.A. 15(3-5),103

de la Sen, M. 15(1),47
Diligenti, M. 15(3-5),71
Dodd, F.J. 15(10),135
Dominguez, J. 15(3-5),119
Donegan, H.A. 15(10),135
Dunnett, S.J. 15(3-5),131

El Naschie, M.S.
 15(11),17,(12),77
El-Damanawi, K.E.K.
 15(3-5),205
Elnashaie, S.S.E.H.
 15(1),17,(7),43,(11),17
Elsinari, A.M.A. 15(6),83
Ervin, V.J. 15(3-5),93

Feiring, B.R. 15(10),91
Fell, D.A. 15(12),15
Fery, J.J. 15(10),13

Foces, A. 15(3-5),143
Fong, N.K. 15(7),63
Fujio, H. 15(1),65

Gabetta, E. 15(1),1
Gallego, R. 15(3-5),119
Garrido, J.A. 15(3-5),143
Gertsbakh, I. 15(2),59
Ghahramani, S. 15(11),57
Gipson, G.S. 15(3-5),vii,59
Goh, C.J. 15(2),49
Gonsalves, I.R. 15(3-5),155
Gray, B.F. 15(11),25
Gray, L.J. 15(3-5),165
Greenberg, I. 15(6),51
Greiner, H. 15(10),97
Guiggiani, M. 15(3-5),175
Guillez, A. 15(10),13
Guo, B.Z. 15(10),49
Gzyl, H.
 15(1),43,(7),55,(11),129

Hall, W.S. 15(3-5),313
Han, W.
 15(8),65,(9),47,(12),67
Hansen, E.B. 15(3-5),185
Hariti, A. 15(2),1
Helal, A.M. 15(1),17,(7),43
Hibbs, T.T. 15(3-5),313
Holmes, M.H. 15(11),35
Hsu, C.-H. 15(9),21
Huang, C.-F.D. 15(3-5),215
Hughes, J.B. 15(12),29
Hwang, C.-L. 15(8),49
Hwang, W.-M. 15(11),9
Hwang, Y.-W. 15(11),9

Ingber, L.
 15(1),65,(11),77,99
Ingham, D.B.
 15(3-5),195,131

Jabbour, G.M. 15(11),77
Jaswon, M.A. 15(3-5),205
Jian, C. 15(6),43
Johnston, P.R. 15(10),115
Joshi, R.R. 15(12),91
Jumarie, G. 15(12),103

Kar, B.K. 15(6),9
Karabalis, D.L. 15(3-5),215
Kasparian, V. 15(12),3
Kim, D.-S. 15(6),55

Kishimoto, K. 15(3-5),11
Kokoska, S.M. 15(9),65
Kramer, B.A. 15(8),49
Kramer, I. 15(9),1
Kress, R. 15(3-5),229
Krishna Kumar, B.
 15(1),11,(2),41
Kuwahara, K. 15(6),69
Kwon, P.S.-J. 15(7),1
Kwong, P.C.K. 15(10),49

Lam, K.-T. 15(9),21
Lambert, J.M. 15(11),141
Lavigne, D. 15(10),125
Lee, C.S. 15(10),79
Leguizamón, C.A. 15(8),89
Leitmann, G. 15(10),79

Madrid, A. 15(3-5),23
Maguire, P.A. 15(7),1
Maier, G. 15(3-5),71
Mann, Jr., J.E. 15(8),17
Marcassa, F. 15(10),13
Marcos, G. 15(8),77
Meeker, L.D. 15(9),65
Mees, A.I. 15(1),33,(2),49
Merkin, J.H. 15(11),25
Misra, J.C. 15(6),9
Mizzi, P.J. 15(9),55
Mohamed, A.S.A. 15(10),19
Moth, J. 15(8),37
Mukherjee, S.
 15(3-5),1,245
Muraskin, M. 15(11),63

Nagurney, A. 15(6),55
Nakamura, M. 15(3-5),295
Nihoul, J.C.J. 15(12),117

Olinick, M. 15(6),91
Olson, D.L. 15(7),83
Osias, J.R. 15(3-5),103

Panagiotopoulos, P.D.
 15(3-5),257
Paris, F. 15(3-5),143
Parthasarathy, P.R.
 15(1),11,(2),41
Pascal, H. 15(10),107
Pascal, J.P. 15(10),107
Petrack, M.H. 15(8),1
Pham, H. 15(6),1,77
Picone, J.B. 15(8),17

Rao, P.M. 15(6),69
Revetta, Jr., J.J. 15(9),77
Ritchie, J.A. 15(3-5),195
Rizzo, F.J. 15(3-5),155
Rudolphi, T.J. 15(3-5),269

Saha, S.K. 15(10),61
Saigal, S. 15(3-5),1
Sanghi, V.K.C. 15(2),13
Sauro, H.M. 15(12),15
Schlosser, J. 15(9),39
Schochetman, I.E. 15(2),59
Shaw, R.P. 15(3-5),279
Shillor, M. 15(2),59
Shippy, D.J. 15(3-5),155
Sjogren, J.A. 15(9),87
Smith, R.N.L. 15(3-5),285
Sperelakis, N. 15(8),17
Srivastava, R. 15(3-5),81
Stein, W. 15(9),55

Stephan, M. 15(3-5),93
Sworder, D.D. 15(11),99
Symm, G.T. 15(3-5),vii

Tailleur, S. 15(8),77
Tan, W.Y.
15(2),19,(7),15,(12),37
Tanaka, M. 15(3-5),295
Taylor, C.M. 15(3-5),195
Telles, J.C.F. 15(3-5),303
Thompson, H.J. 15(9),65
Turner, W.J. 15(7),1

Vellor, R.C. 15(7),83
Venkataramanan, M.A.
15(8),71

Wagialla, K.M. 15(7),43
Wake, G.C. 15(11),25
Wasniewski, J. 15(8),37

Wehner, M.F.
15(1),65,(11),77
Weimin, Z. 15(6),43
Wendland, W.L.

15(3-5),325,(6),19
Wendroff, B. 15(9),39
Wgialla, K.M. 15(1),17
Wigdorowitz, B. 15(8),1
Woodside, W. 15(10),1

Yamagiwa, K. 15(3-5),295
Yongxian, W. 15(6),43

Zaremba, L.S. 15(12),81
Zaretzky, A.N. 15(8),89
Zhao, X.-Q. 15(11),3
Zhu, J. 15(3-5),325,(6),19
Žitňan, P. 15(7),37
Zlatev, Z. 15(8),37

NEW

Concise Encyclopedia of Modelling & Simulation

Edited by **D PATHERTON**, *University of Sussex, Brighton, UK*
& **P BORNE**, *Institut Industriel du Nord, Villeneuve d'Ascq, France*

The *Concise Encyclopedia of Modelling & Simulation* contains 172 alphabetically arranged articles, describing the modelling and simulation of physical systems. The emphasis is on mathematical models and their various forms: although other types of models, such as, knowledge-based, linguistics-based, graphical or data-based are also discussed. The articles are revised from the *Systems & Control Encyclopedia*, and many newly commissioned articles are included describing recent developments in the field. Articles on identification cover all aspects of this problem, from the use and choice of specific test signals to problems of model order and the many algorithms and approaches to parameter estimation. Computational techniques, such as the finite-element method, that play an important role in analyzing nonlinear models are covered. Articles outline the development of simulation, consider currently available simulation languages, describe applications and cover current developments in the area. Where appropriate, illustrations and tables are included to clarify particular topics. This book will be a valuable reference source for all practising engineers, researchers and postgraduate students in the field of modelling and simulation.

For scientists in academia and industry involved with the design, modelling and simulation of physical systems, and systems and control theorists and practitioners.

248x184 mm 554pp January 1992
0 08 036201X (H) **£140.00 / US\$240.00**

Contents: Selected Articles: Abstract realization theory. Aggregation, chained. Aggregation: model reduction. Automatic modelling of three-dimensional objects. Bayes' rule. Causality. Chaotic behavior. Closed-loop systems. Cognition. Combined discrete and continuous models: firmware. Comparison systems. Composite systems. Constraints. Data. Databases. Deterministic systems. Differential equations. Digraphs. Distributed parameter systems. Emulation and microprogramming. Entropy. Exogenous variables. Feedback loops. Finite-difference method. Finite-element method. Flexible manufacturing systems. Forecasts. Fuzzy models. Hypotheses. Identification. Identification: correlation methods. Identification: Psuedorandom signal method. Information processing. Integrodifferential systems. Kalman filters. Laplace transforms. Linear systems: Kronecker canonical forms and invariants. Markov processes. Mechanical systems simulation. Model-based fault diagnosis. Modelling of industrial robots. Multigrid methods. Nonlinear effects and their modelling. Nuclear reactor modelling. Object-oriented simulation. Observability. Open-loop systems. Outputs. Parameters. Partial differential equation models: numerical solution. Petri nets. Polynomial matrices in systems theory. Project management: network models. Reliability. Servovalves, electrohydraulic. Simulation languages. Singular systems. Smith—McMillan canonical forms for rational matrices. Stochastic processes. Taxonomy. Time horizons. Transfer functions. Truncation. Validation of identified models. Verification. Vibrations and vehicle dynamics. Wave propagation in periodic structures. Workshop dynamic modelling.

Sterling prices quoted apply worldwide except in the Americas. US Dollar prices quoted apply in the Americas only.

Prices and proposed publication dates are subject to change without prior notice.



PERGAMON PRESS
Pergamon Press plc, Headington Hill hall, Oxford OX3 0BW, UK
Pergamon Press, Inc., 395 Saw Mill River Road, Elmsford, NY 10523, USA



AUT 025/12/91